US006253584B1

(12) **United States Patent**
Shin

(10) **Patent No.: US 6,253,584 B1**
(45) **Date of Patent: Jul. 3, 2001**

(54) **WASHING MACHINE HAVING A DEVICE FOR FILTERING DIRT IN WASHING WATER**

(75) Inventor: **Jeong Soo Shin**, Suwon (KR)

(73) Assignee: **Samsung Electronics Co., Ltd.**, Suwon (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/423,215**

(22) PCT Filed: **Jan. 18, 1999**

(86) PCT No.: **PCT/KR99/00029**

§ 371 Date: **Nov. 4, 1999**

§ 102(e) Date: **Nov. 4, 1999**

(87) PCT Pub. No.: **WO99/45187**

PCT Pub. Date: **Sep. 10, 1999**

(30) **Foreign Application Priority Data**

Mar. 5, 1998 (KR) 98/7265
May 13, 1998 (KR) 98/17180

(51) **Int. Cl.**[7] **D06F 39/10**
(52) **U.S. Cl.** ..... **68/13 R**; 68/18 F
(58) **Field of Search** ..... 68/13 R, 18 R, 68/18 F, 18 D

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,194,628 * 7/1965 Cannon ..... 68/13 R X
3,313,311 * 4/1967 Gilson ..... 68/18 F X

FOREIGN PATENT DOCUMENTS

43 42 049 A1 6/1995 (DE) .
0 146 719 7/1985 (EP) .
0585519 * 3/1994 (EP) ..... 68/18 F

* cited by examiner

Primary Examiner—Philip R. Coe
(74) *Attorney, Agent, or Firm*—Larson & Taylor, PLC

(57) **ABSTRACT**

Disclosed is a washing machine having a device **(30)** for filtering dirt in washing water. The device has a drawing pipe **(31)** connected to a tub **(21)** for accommodating laundry and water, a pump **(33)** for drawing the water in the tub into the drawing pipe, a cylinder **(35)** for receiving the water supplied from the drawing pipe, a rotating blade for generating a water-flow vortex in the cylinder, and a return pipe **(37)** for returning the water in which dirt has been filtered into the tub. The device can filter the dirt in the water effectively, and need not be cleaned frequently.

10 Claims, 6 Drawing Sheets

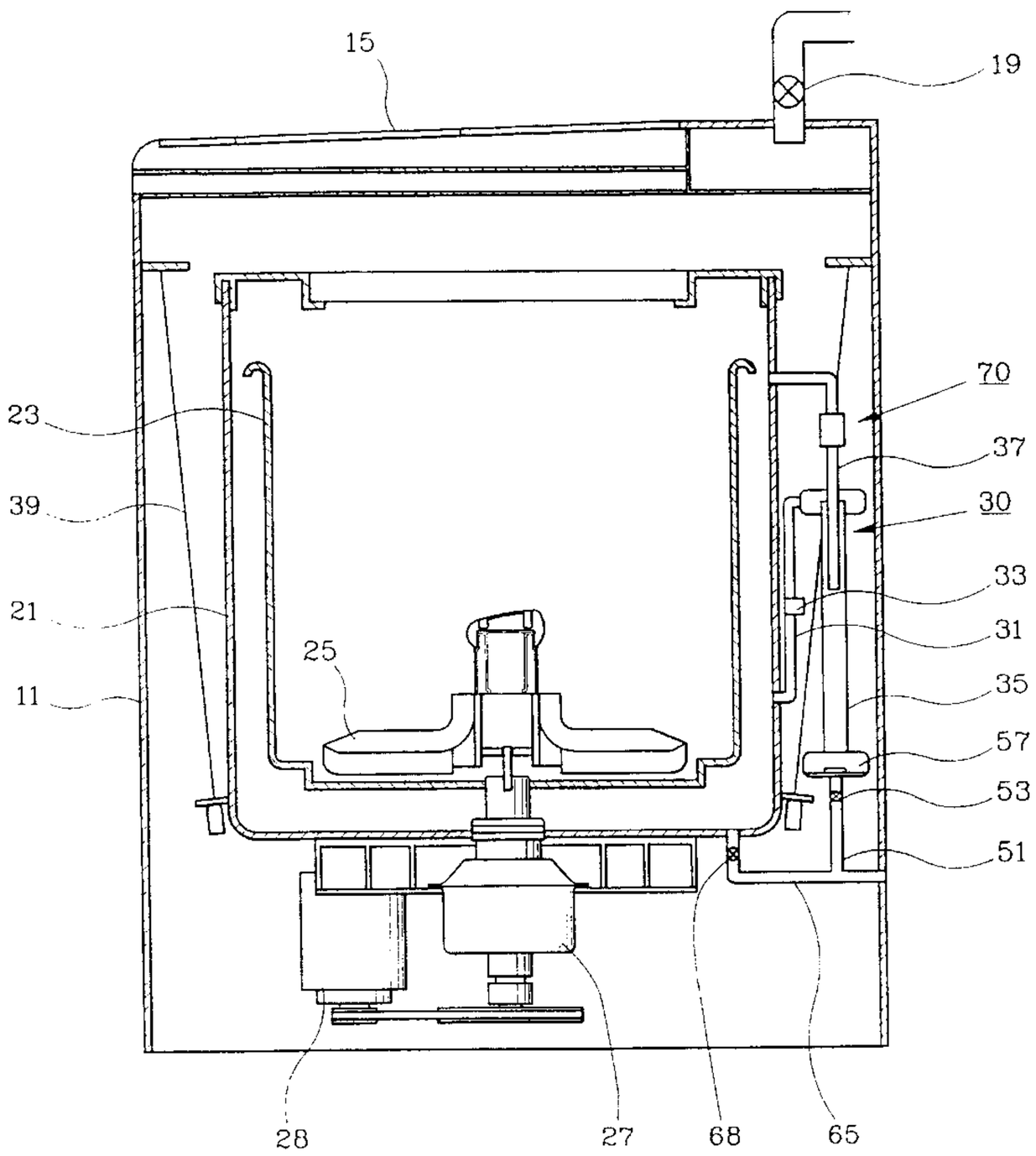


FIG . 1

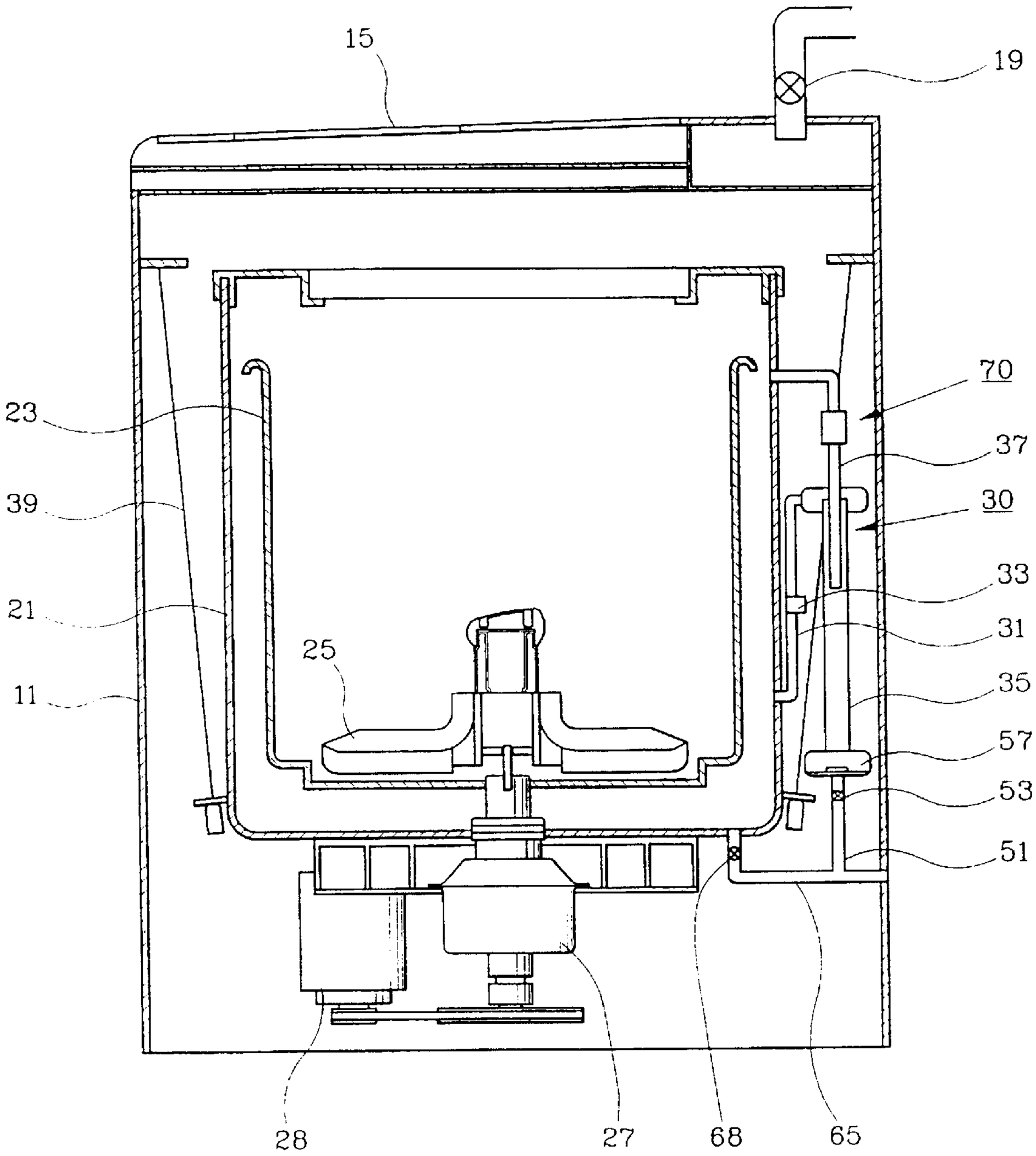


FIG . 2

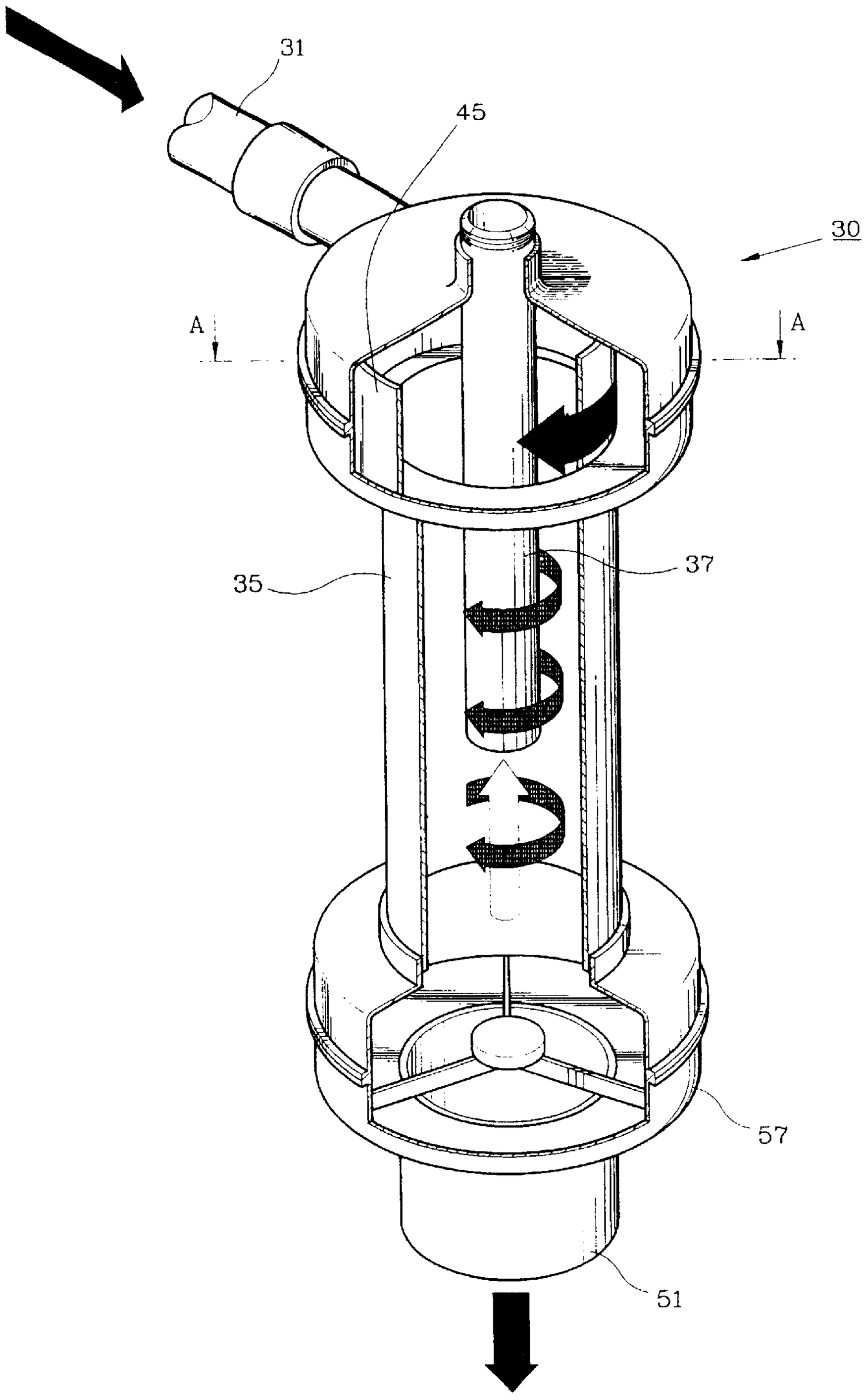


FIG . 3

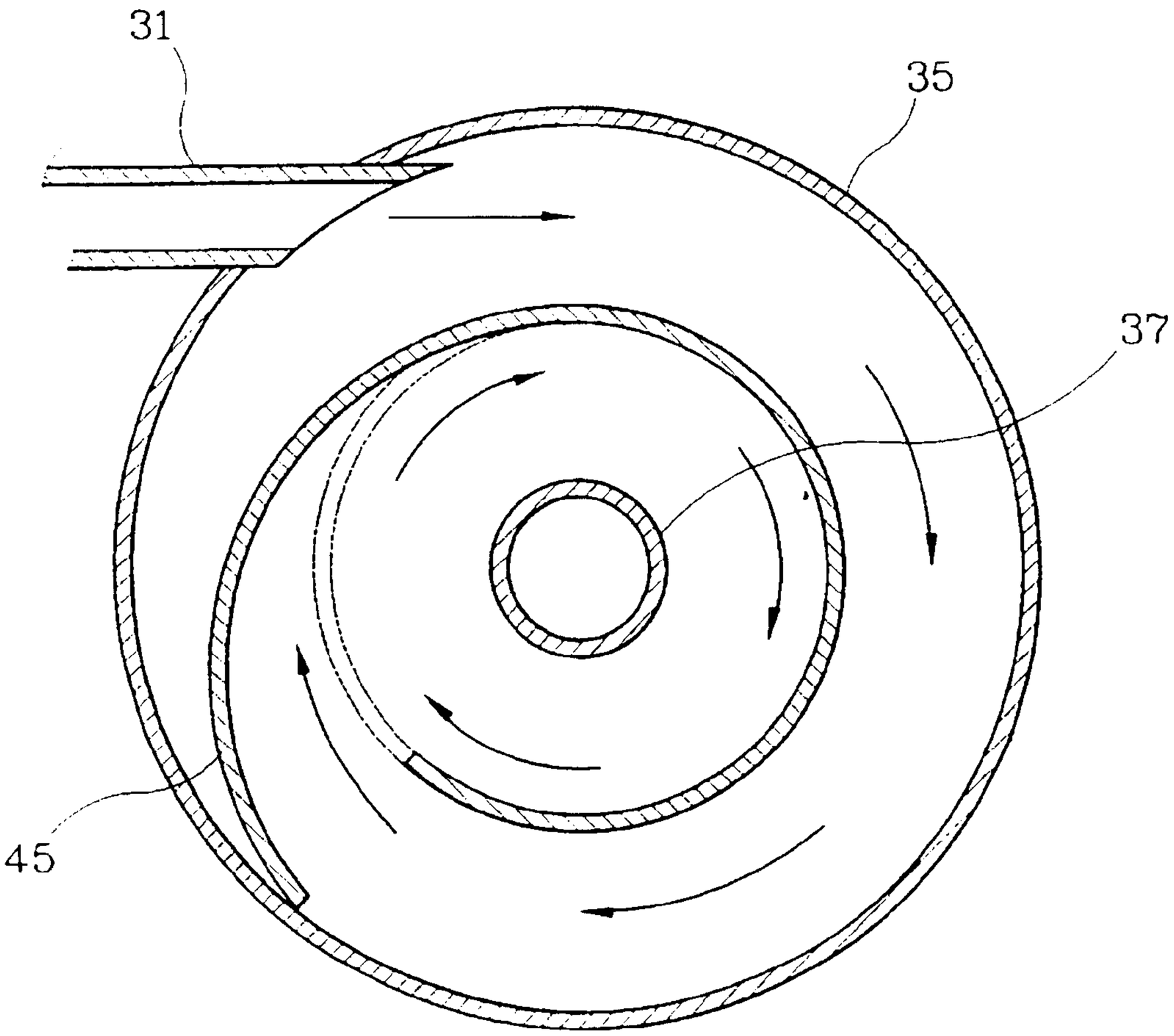


FIG. 4

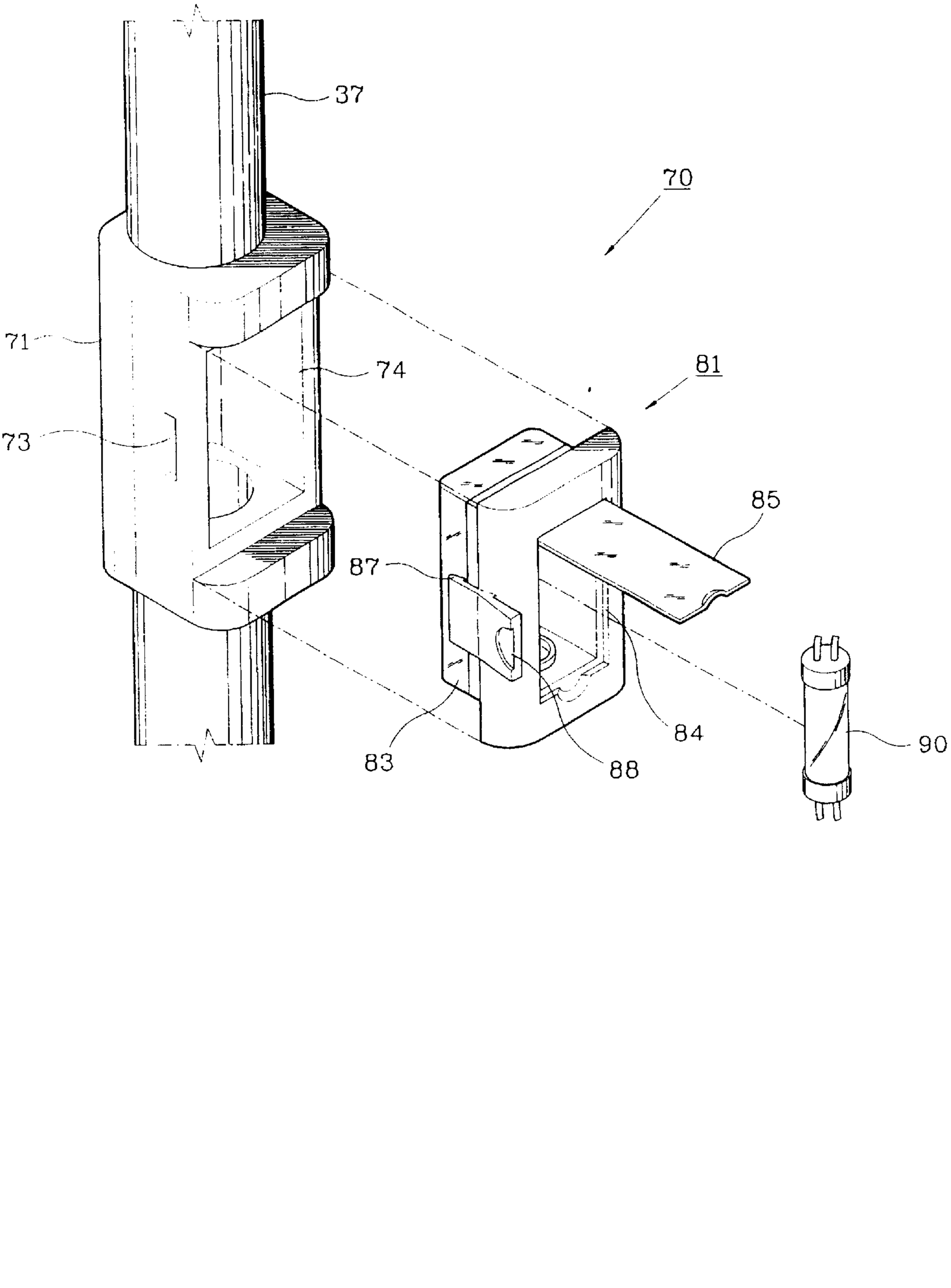


FIG . 5

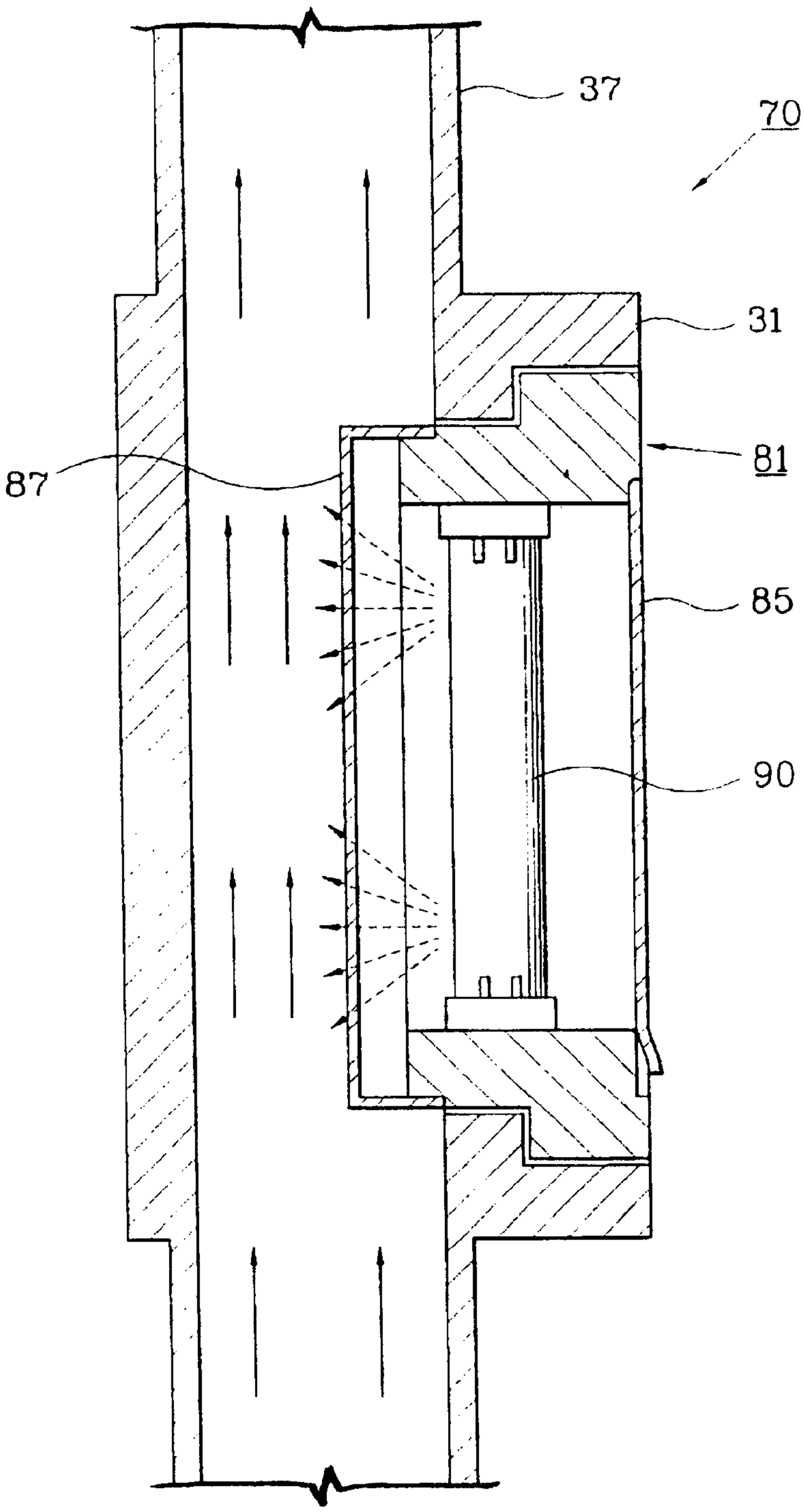
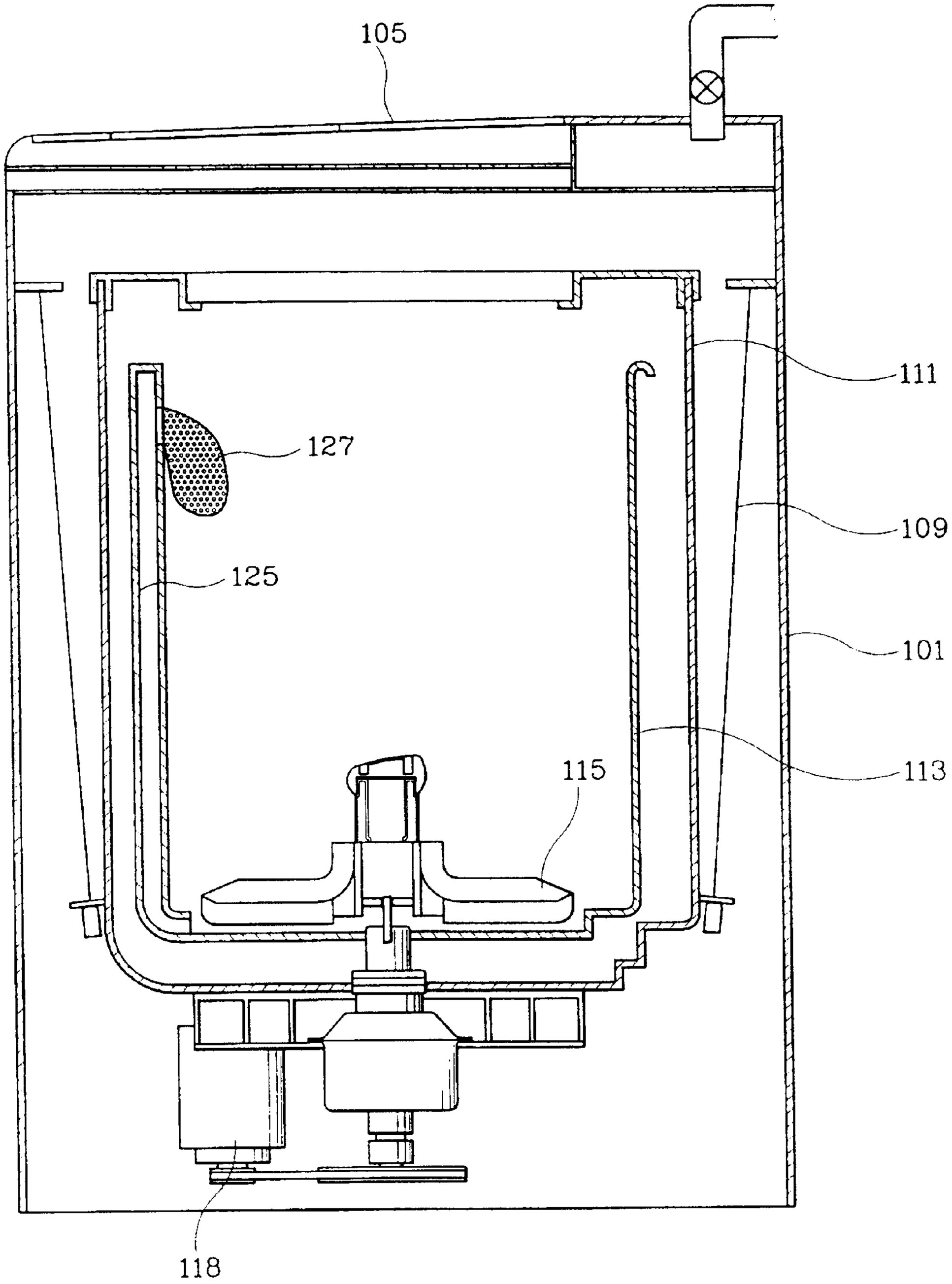


FIG . 6 (PRIOR ART)



WASHING MACHINE HAVING A DEVICE FOR FILTERING DIRT IN WASHING WATER

TECHNICAL FIELD

The present invention relates to a washing machine, and more particularly, to a washing machine having a device for filtering dirt in washing water.

BACKGROUND ART

FIG. **6** is a side sectional view of a conventional washing machine. The washing machine has an outer casing **101**, a top cover **105** covering the upper side of the outer casing **101**, an outer tub **111** suspended by a suspension in the outer casing **101**, a washing tub **113** rotatably installed in the outer tub **111**, a pulsator **115** installed on the bottom of the washing tub **113**, and a driving motor **118** for driving the pulsator **115**.

During the washing operation, the driving motor **118** rotates the pulsator **115**, and by the water-flow vortex generated in such a situation, the laundry in the washing tub **113** is washed. During the dehydrating operation, the pulsator **115** and the washing tub **113** are rotated together at a high speed, and the laundry is dehydrated by the centrifugal force generated in that situation.

During the washing operation, the water in the washing tub **113** contains dirt detached from the laundry, and if the washing water contains too much dirt, the washing effect is lowered. Thus, the washing machine is equipped with a device for filtering dirt in the washing water.

The filtering device is comprised of a circulation duct **125** formed vertically on the inner wall of the washing tub **113**, and a filtering web **127** installed on the upper end of the circulation duct **125**. The lower end of the circulation duct **125** is open at the lower area of the washing tub **113**, and the upper end thereof is open at the upper area of the washing tub **113**.

By the centrifugal force of the water-flow vortex generated in the washing tub **113**, the washing water in the washing tub **113** flows into the circulation duct **125** through the lower opening of the circulation duct **125**. The water in the circulation duct **125** is moved up along the circulation duct **125**, and then is supplied again into the washing tub **113**. In this situation, the dirt contained in the re-supplied washing water is filtered by the filtering web **127**, and accordingly, the washing water in which dirt has been filtered is supplied into the washing tub **113**.

However, in such a conventional washing machine, the filtering efficiency is lowered gradually as the dirt is accumulated in the filtering web **127**, so the filtering web **127** must be cleaned frequently. And, the filtering web **127** is apt to wear, so it should be exchanged with a new one frequently. Furthermore, there is another shortcoming that the small and weighty dirt such as sand cannot be filtered well.

DISCLOSURE OF INVENTION

The present invention has been proposed to overcome the above-described problems in the prior art, and accordingly it is the object of the present invention to provide a washing machine having a filtering device which can filter the dirt in the washing tub effectively, does not need a frequent cleaning, and can be used semi-permanently.

To achieve the above object, the present invention provides a washing machine comprising: a tub for accommodating laundry and water; a drawing pipe connected to the tub; a drawing pump installed on an area of the drawing pipe, the drawing pump for drawing the water in the tub into the drawing pipe; a cylinder of which the upper portion is connected with the drawing pipe, the cylinder for receiving the water supplied from the drawing pipe; a rotating blade for generating the water-flow vortex in the cylinder; and a return pipe extended downward at a predetermined length from the upper side of the cylinder to the inner side of the cylinder along an axis of the vortex, the return pipe for returning the water in which dirt has been filtered into the tub.

A dirt collection part for collecting the dirt separated from the water is installed under the cylinder. The dirt collected in the dirt collection part is discharged by a discharging means. The discharging means comprises: a discharge pipe extended from the dirt collection part toward the outside; and a discharge valve for opening/closing the discharge pipe.

According to the preferred embodiment of the present invention, a sterilizing means is installed on a position of a path that the water circulates via the drawing pipe, the cylinder and the return pipe, the sterilizing means for sterilizing the water circulating through the path. The sterilizing means comprises: an ultraviolet lamp for generating ultraviolet rays; and a lamp casing for accommodating the ultraviolet lamp, the lamp casing of which a part contacting with the water is made of a material transmitting the ultraviolet rays.

According to the present invention, a washing machine having a filtering device is provided which can filter the dirt in washing water effectively, and need not be cleaned frequently. Furthermore, a sanitary washing operation can be performed by the sterilizing device.

BRIEF DESCRIPTION OF DRAWINGS

The present invention will be better understood and its various objects and advantages will be more fully appreciated from the following description taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a side sectional view of a washing machine according to the present invention;

FIG. **2** is an enlarged perspective view of a filtering device shown in FIG. **1**;

FIG. **3** is a sectional view of FIG. **2** taken along the line A—A;

FIG. **4** is a perspective view of a sterilizing device shown in FIG. **1**;

FIG. **5** is an enlarged side sectional view of the assembled state of FIG. **4**; and

FIG. **6** is a side sectional view of a conventional washing machine.

BEST MODE FOR CARRYING OUT THE INVENTION

Hereinafter, the present invention will be described in detail with reference to the accompanying drawings.

FIG. **1** is a side sectional view of a washing machine according to the present invention. The washing machine has an outer casing **11**, a top cover **15** covering the upper side of the outer casing **11**, an outer tub **21** suspended by suspensions **39** in the outer casing **11**, a washing tub **23** rotatably installed in the outer tub **21**, a pulsator **25** installed on the bottom of the washing tub **23**, a driving motor **28** for driving the pulsator **25**, a gear assembly **27** for transmitting the driving force of the driving motor **28** to the pulsator **25**

and/or the washing tub **23**, and a water supply valve **19** for supplying water into the washing tub **23** and the outer tub **21**.

During the washing operation, the driving motor **28** rotates the pulsator **25**, and by the water-flow vortex generated in such a situation, the laundry in the washing tub **23** is washed. During the dehydrating operation, the pulsator **25** and the washing tub **23** are rotated together at a high speed, and the laundry is dehydrated by the centrifugal force generated in that situation.

A drain pipe **65** is installed on the lower side of the outer tub **21**, and a drain valve **68** is installed on the drain pipe **65**. When the dehydrating operation is completed, the drain valve **68** opens the drain pipe **65** so as to drain the water in the outer tub **21** and the washing tub **23** toward an outside.

A filtering device **30** is installed beside the outer tub **21**. The filtering device **30** is, as shown in FIGS. **1** and **2**, comprised of a drawing pipe **31** connected to the outer tub **21**, a drawing pump **33** installed in the middle of the drawing pipe **31**, a cylinder **35** connected with the drawing pipe **31**, a rotating blade **45** installed in the cylinder **35**, and a return pipe **37** connected to the cylinder **35**.

The drawing pipe **31** is connected to the upper part of the cylinder **35** by a predetermined angle against the radial direction of the cylinder **35** as shown in FIG. **3**. The drawing pump **33** draws the water in the outer tub **21** into the drawing pipe **31**. The water drawn into the drawing pipe **31** is supplied into the cylinder **35**.

The rotating blade **45** is curved spirally about the axis of the cylinder **35**, and is rotated by a motor which is not shown in the figures. As the rotating blade **45** rotates, the water-flow vortex is generated in the cylinder **35**.

The return pipe **37** is extended from the upper side of the cylinder **35** to the middle position of the cylinder **35** along the rotational axis of the water-flow vortex. The upper end of the return pipe **37** is connected to the outer tub **21**. The water in the cylinder **35** is returned into the outer tub **21** through the return pipe **37**.

A dirt collection part **57** for collecting the dirt separated from the washing water is formed under the cylinder **35**. A discharge pipe **51** for discharging dirts collected in the dirt collection part **57** toward the outside is installed under the dirt collection part **57**. The lower end of the discharge pipe **51** is connected to the drain pipe **65**.

Meanwhile, the washing machine has a device **70** for sterilizing the washing water. The sterilizing device **70** is installed on a position of a path that the washing water is circulating via the drawing pipe **31**, the cylinder **35** and the return pipe **37**, and preferably, is installed on a middle area of the return pipe **37** as shown in FIG. **1**.

As shown in FIGS. **4** and **5**, the sterilizing device **70** is comprised of an ultraviolet lamp **90** for generating ultraviolet rays, and a lamp casing **81** for accommodating the ultraviolet lamp **90**. Power supply wires for supplying the ultraviolet lamp **90** with an electrical power are connected to the lamp casing **81**.

An accommodation part **71** for accommodating the lamp casing **81** is provided on the return pipe **37**. The accommodation part **71** has an assembly opening **74** with which the lamp casing **81** is assembled, and a fixing recess **73** for fixing the lamp casing **81**.

The lamp casing **81** has an assembly section **83** assembled with the assembly opening **74** of the accommodation part **71**, and a fixing lever **87**. When the assembly section **83** is inserted into the assembly opening **74**, the fixing lever **87** is assembled with the fixing recess **73** of the accommodation part **71**, and therefore, the assembly section **83** is fixed while being inserted into the assembly opening **74**. A knob depression **88** is formed on the outer side of the fixing lever **87**. A user pushes the knob depression **88** to disassemble the fixing lever **87** from the fixing recess **73**, and thereby the lamp casing **81** is disassembled from the accommodation part **71**.

The assembly section **83** is in contact with the water flowing in the return pipe **37** while it is inserted into the assembly opening **74**. The assembly section **83** is made of a material transmitting the ultraviolet rays so that the ultraviolet rays are projected on the water.

An opening **84** is formed on the outer side of the lamp casing **81** so that the ultraviolet lamp **90** can be installed on, and removed from, the lamp casing **81** therethrough, and a cover **85** is installed on the opening **84**. The cover **85** is preferably made of a transparent material. The user can inspect the ultraviolet lamp **90** through the transparent cover **85** whether it is operating normally or not.

Hereinbelow, the operation of the washing machine according to the present invention will be described.

While the washing machine is performing the washing operation, the water in the outer tub **21** is drawn by the drawing pump **33**, and the rotating blade **45** is rotated by the motor (not shown). Accordingly, the water is supplied from the drawing pipe **31** into the cylinder **35** continuously, and the water-flow vortex is generated in the cylinder **35** by the rotating blade **45** as shown in FIGS. **2** and **3** with arrows. Since the drawing pipe **31** is tilted against the radial direction of the cylinder **35** as shown in FIG. **3**, the water-flow vortex is generated more effectively in the cylinder **35**.

The water in the cylinder **35** receives a centrifugal force by the water-flow vortex. Thus, the weighty dirt contained in the water is distributed into the outer part of the vortex, and only the water without the dirt exists in the central part of the vortex. As the water is continuously supplied from the drawing pipe **31**, the water in the lower portion of the cylinder **35** is supplied into the return pipe **37** by the hydraulic pressure of the water supplied from the drawing pipe **31**, and the water and the dirt in the cylinder **35** are moved down gradually. Since the return pipe **37** is positioned on the axis of the water-flow vortex, only the water without the dirt is supplied into the return pipe **37**, and the dirt is collected in the dirt collection part **37**. The water supplied into the return pipe **37** is returned into the outer tub **21**. Therefore, the water in which dirt has been filtered is re-supplied into the outer tub **21**.

When a large amount of dirt is collected, the discharge valve **53** opens the discharge pipe **51** to discharge the dirt in the dirt collection part **57** toward the outside through the discharge pipe **51**.

Meanwhile, the water returned through the return pipe **37** is sterilized by the sterilizing device **70**. Therefore, a sanitary washing is performed. The user can inspect the ultraviolet lamp **90** through the transparent cover **85**. And, since the lamp casing **81** can be detached, the ultraviolet lamp **90** can be exchanged with a new one easily when a breakdown occurs.

As described above, according to the present invention, a washing machine having a filtering device **30** is provided which can filter the dirt in washing water effectively, and need not be cleaned frequently. Furthermore, a sanitary washing operation can be performed by the sterilizing device **70**.

Although the present invention has been described and illustrated in detail, it is clearly understood that the same is by way of illustration and example only and is not to be

taken by way of limitation, wherein the spirit and scope of the present invention is limited only by the terms of the appended claims.

What is claimed is:

1. A washing machine comprising:

a tub for laundry and water;

a drawing pipe connected to the tub;

a drawing pump associated with the drawing pipe for drawing the water in the tub into the drawing pipe;

a cylinder for receiving water supplied from the drawing pipe and having an upper portion connected to the drawing pipe;

a rotating blade for generating a water-flow vortex in the cylinder; and

a return pipe, extending downwardly a predetermined distance from the upper side of the cylinder to an inner side of the cylinder along an axis of the vortex, for returning water from which dirt has been filtered into the tub.

2. The washing machine as claimed in claim **1**, further comprising a dirt collection part, installed under the cylinder, for collecting the dirt separated from the water.

3. The washing machine as claimed in claim **2**, further comprising discharging means for discharging the dirt collected in the dirt collection part.

4. The washing machine as claimed in claim **3**, wherein the discharging means comprises:

a discharge pipe extending from the dirt collection part toward the outside; and

a discharge valve for opening and closing the discharge pipe.

5. The washing machine as claimed in claim **1**, wherein the drawing pipe is connected with the cylinder at a predetermined angle with respect to a radial direction of the cylinder.

6. The washing machine as claimed in claim **1**, further comprising a sterilizing means, installed at a position along a water circulation path including the drawing pipe, the cylinder and the return pipe, for sterilizing the water circulating through the path.

7. The washing machine as claimed in claim **6**, wherein the sterilizing means is installed at a position along the return pipe.

8. The washing machine as claimed in claim **6**, wherein the sterilizing means comprises:

an ultraviolet lamp for generating ultraviolet rays; and

a lamp casing for accommodating the ultraviolet lamp, the lamp casing including a part contacting the water, said part being made of a material for transmitting the ultraviolet rays.

9. The washing machine as claimed in claim **8**, wherein an opening is formed on an outer side of the lamp casing so that the ultraviolet lamp can be installed on, and removed from, the lamp casing therethrough; and

a cover is installed on the opening.

10. The washing machine as claimed in claim **9**, wherein the cover is made of a transparent material.

* * * * *